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CHAPTER 10

MOTIVATED FORGETTING

Michael C. Anderson

People usually think of forgetting as something bad. It is to lose our cherished past, to forget friends' names, and to neglect our responsibilities. But as AJ's remarkable memory illustrates (see Chapter 9, pp. 192–193), forgetting might be more desirable than we think. AJ often yearns to forget, so that she can avoid continually reliving the events and emotions of terrible times. She has difficulty "letting go" and "getting past" things that most of us get over quickly. These sentiments reveal that, more often than we realize, forgetting is exactly what we need to do. Sometimes we confront reminders of experiences that sadden us, as when after the death of a loved one or when, after a broken relationship, objects and places evoke memories of the lost person. Other times, reminders trigger memories that make us angry, anxious, ashamed, or afraid; a face might remind us of an argument that we hope to get past; an envelope might bring to mind a very unpleasant task we are avoiding; or an image of the World Trade Center in a movie might elicit upsetting memories of 11 September. In the popular film, *Eternal sunshine of the spotless mind*, the main character, Joel, suffers so badly from memories of his lost love, Clementine, he seeks out a memory deletion clinic, to have all memories of her removed from his brain. Unfortunately, although we might at times yearn for them, no such clinics exist, and we cannot avoid life's tendency to insert memories we wish were not there.

Jim Carrey's character, Joel, in Michel Gondry's film *Eternal sunshine of the spotless mind*, hires a service to permanently erase painful memories of his ex-girlfriend from his mind. While such technology is science fiction, our desire and ability to control our memory is very much a reality. © Steve Sands/New York Newswire/Corbis.

People do not take this situation lying down, however. They do something about it. When we confront reminders to unwanted memories, a familiar reaction often occurs—a flash of experience and feeling followed rapidly by an attempt to exclude the memory from awareness. Unlike in most other situations, retrieval is unwanted and must be shut down. Suppressing retrieval shuts out the intrusive memories, restoring control over the direction of thought and our emotional well-being. Indeed, for veterans, witnesses of terrorism, and countless people experiencing personal traumas, the day-to-day reality of the need to control intrusive memories is all too clear. Any serious and general treatment of forgetting therefore needs to consider the motivated involvement of individuals as conspirators in their own memory failures. Is my failure to remember knocking over the Christmas tree (see Chapter 9, p. 191) simply an accident of normal forgetting? Is the fact that you "forgot" to do that unpleasant task, *yet again*, truly an innocent mistake? In this chapter, we consider what is known about how people forget things that they would prefer not to remember.

LIFE IS GOOD, OR MEMORY MAKES IT SO

With surprising consistency, people across the world, of all ages, ethnicities, and income levels report being generally happy with their lives. This feeling of well-being is widespread, and often defies people's objective circumstances. It is found in people with physical or mental disabilities, and in people with low incomes (Diener & Diener, 1996; Lykken & Tellegen, 1996). Research suggests that memory contributes to this perceived well-being. Our assessment of how we are doing in life relies on what we remember. For example, people show a strong **positivity bias** in what they remember over the long-term. In an early illustration of this bias, Waldfogel (1948) gave participants 85 minutes to generate as many memories as they could recall from the first 8 years of their lives. Of these memories, people rated 50% as pleasant, 30% as unpleasant, and 20% as neutral, suggesting that, for whatever reason, positive memories were simply more accessible. A similar finding occurs when, instead of asking people to generate memories intentionally, you ask them to note memories that "spontaneously" pop into mind over a longer period. Of the involuntary reminders reported in a study by Bernsten (Bernsten, 1996), 49% were pleasant, 32% neutral, and 19% unpleasant. This positivity bias increases as we get older and grow to focus more on emotional goals and on maintaining a sense of well-being. Why do such effects occur? Are memories of positive events more frequent because those types of events are more common, or might people's motivations have something to do with it?

Susan Charles, Mara Mather, and Laura Carstensen (2003) conducted a simple and compelling study suggesting that our memory biases are no accident. They asked younger and older adults to view 32 scenes. The scenes included a mixture of pleasant, neutral, and rather unpleasant images. After a 15-minute delay, participants recalled as many of the pictures as they could. As illustrated in Figure 10.1, pictures with emotional content were recalled better, in general, than were neutral pictures, and older adults recalled fewer pictures than did younger adults. Importantly, however, as participants got older, their memories became progressively more biased in favor of positive scenes over negative ones, even though all scenes were viewed for the same amount of time: Whereas young participants recalled positive and negative scenes with equal frequency, older adults recalled nearly twice as many positive as negative scenes. A subsequent test revealed that older adults could recognize the positive and negative scenes equally well, indicating that they both made it into memory. For some reason, however, negative events were not recalled as well. Similar age-related emotional biases have been observed with words and faces (Leigland, Schulz, & Janowsky, 2004). In a review of research on aging and positivity effects, Mather and Carstensen (2005) build a compelling case that, as we get older and life grows short, people focus more on maintaining a sense of well-being, and less on

KEY TERM

Positivity bias: The tendency, increasing over the lifespan, to recall more pleasant memories than either neutral or unpleasant ones.

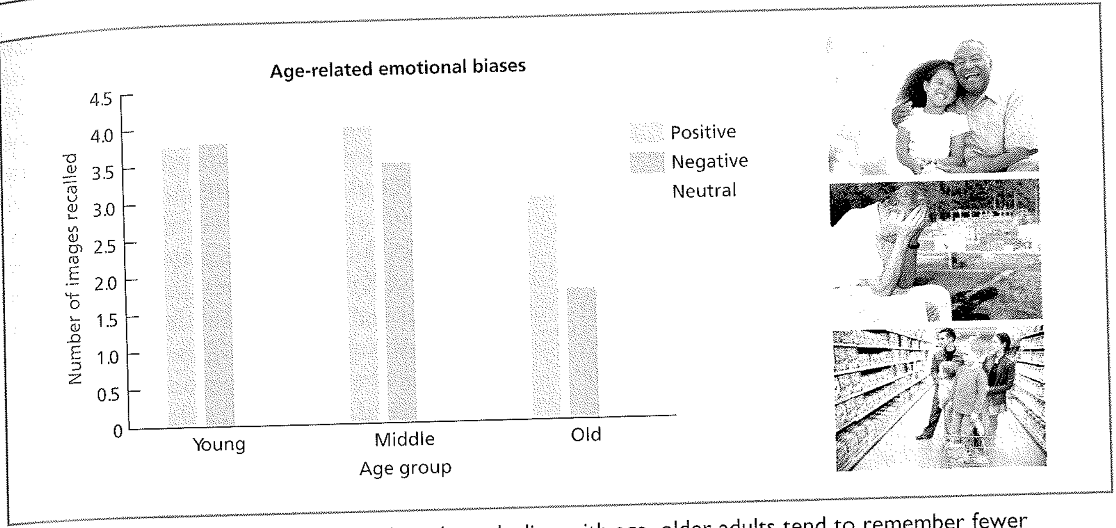


Figure 10.1 Although memory overall tends to decline with age, older adults tend to remember fewer negative memories relative to positive ones, demonstrating an age-related positivity bias. From Charles, Mather, and Carstensen (2003). Copyright © American Psychological Association. Reproduced with permission. Right: Examples of the types of positive, negative, and neutral images that were used in the study.

goals concerning knowledge and the future. As a result, people grow skilled in **emotion regulation**, which includes, in part, controlling what we remember. How could this possibly happen? What processes contribute to motivated forgetting?

TERMINOLOGY IN RESEARCH ON MOTIVATED FORGETTING

It is important to clarify certain terms and distinctions that will arise in our discussion of how motives alter our memories. Perhaps the most well known term relating to motivated forgetting is **repression**, popularized by Sigmund Freud through his psychoanalytic theory. In Freud's framework, repression refers to a psychological defense mechanism that banishes unwanted memories, ideas, and feelings into the unconscious to reduce conflict and psychic pain. It is one in an arsenal of defensive processes that includes rationalization, projection, and many others. Although Freud used repression in a number of ways, he offered the following simple definition: "The essence of repression lies simply in the function of rejecting and keeping something out of consciousness" (Freud, 1917, p. 147).

Within this framework, repressed contents were not eliminated from the mind, but were excluded from conscious awareness. They could still influence behavior unconsciously, manifesting themselves in our dreams, preferences, choice of topics we discuss, and even our emotional reactions. Moreover, repressed contents were not guaranteed to remain

KEY TERMS

Emotion regulation: Goal-driven monitoring, evaluating, altering, and gating one's emotional reactions and memories about emotional experiences.

Repression: In psychoanalytic theory, a psychological defense mechanism that banishes unwanted memories, ideas, and feelings into the unconscious in an effort to reduce conflict and psychic pain. Theoretically, repression can either be conscious or nonconscious.

unconscious but were thought to pop up again on later occasions, a phenomenon Freud referred to as the *return of the repressed* (e.g. Freud, 1900, 1917).

A distinction is sometimes drawn between *repression* and *suppression*, with the former being an unconscious process and the latter being conscious and intentional. By this view, repression refers to an automatic, defensive process by which a memory is excluded from consciousness without a person ever being aware of its presence. Suppression, on the other hand, refers to intentional, goal-directed exclusion of ideas or memories from awareness. Although the modern psychoanalytic tradition maintains this distinction, Mathew Erdelyi (2006) has shown that the distinction was introduced by Anna Freud, Sigmund Freud's daughter. Erdelyi argues that Freud used the terms interchangeably, and that the distinction distorts his theoretical viewpoint. In this chapter, the term repression can refer to either sense, but when the term suppression is used, we intend to refer specifically to the voluntary sense of the word.

Several other terms often arise that are not linked to Freudian theory, including intentional forgetting and motivated forgetting. *Intentional forgetting* refers to forgetting arising from processes initiated by a conscious goal to forget. It includes conscious strategies to forget, such as suppression and intentional context shifts. Although we discuss intentional forgetting, this term does not capture those cases when forgetting is nonaccidental, but not consciously intended. The broader term *motivated forgetting* encompasses these potential cases. For example, if every time you see someone associated to an unpleasant event your mind steers towards topics unrelated to that event, this motivated bias might induce forgetting without being generated by an intention to forget. Nevertheless, this type of forgetting would clearly be motivated.

Motivated forgetting encompasses the term **psychogenic amnesia**, which means any forgetting that is psychological in origin, and not attributed to biological damage or dysfunction—forgetting that is psychological in genesis. Although psychogenic amnesia and motivated forgetting might be treated synonymously, psychogenic amnesia is generally used for cases of profound and surprising forgetting of major chunks of one's life, or to profound forgetting of a particular event that ought to be remembered. The term is theoretically and mechanistically neutral in that it does not presume Freud's theoretical framework, nor does it say how forgetting is accomplished, merely that the source is psychological rather than biological. Motivated forgetting includes these cases, but it also includes more ordinary, day-to-day examples in which people forget unpleasant things in a way that would not call for clinical evaluation.

FACTORS THAT PREDICT MOTIVATED FORGETTING

Theoretically, controlling unwanted experiences can be accomplished by manipulating any stage of memory. The simplest way to avoid remembering unpleasant events is to limit encoding. You might literally look away from a stimulus, or focus instead on only its pleasant aspects; or, if you are unfortunate enough to have looked at something unpleasant, you might cease elaborative thoughts. If an unwanted experience is encoded, you might avoid reminders to prevent retrieval; or, if reminders are inescapable, you might endeavor to stop retrieval. In all of these examples, mechanisms involved in "normal forgetting" are engaged in service of your emotional goals. Research on motivated forgetting has addressed all of these factors, which we discuss next.

KEY TERM

Psychogenic amnesia: Profound and surprising episodes of forgetting the events of one's life, arising from psychological factors, rather than biological damage or dysfunction.

Instructions to forget

Have you ever told someone to "Forget about it?" Does saying that make a difference? When you recommend this, you presumably have reason to believe that the person can do it. We often have good reason to put things out of mind, even when they are not emotionally significant. Consider Bjork's (1970) example of a short-order cook who, during a typical morning breakfast shift, must process dozens of similar orders. Having completed an order such as, "Scramble two eggs, crisp bacon, and an English muffin," the cook's performance can only suffer if prior orders have not been forgotten. Similarly, we have all experienced times when, after completing a demanding activity, such as an examination, we must "let go" of the information so that our minds can shift to new endeavors. When we return to the "dropped" material, we are often surprised that the knowledge once readily available now eludes us. These examples suggest that forgetting can sometimes be initiated to reduce the tendency for proactive interference to impede our concentration. This idea is often studied with the **directed forgetting** procedure (Bjork, 1970, 1989; see MacLeod, 1998, for a review), in which participants are overtly instructed to forget recently encoded materials.

Directed forgetting: Basic findings

There are two variants of the directed forgetting procedure, each of which involves different forgetting processes. In *item-method directed forgetting*, a participant receives a series of items to remember, one at a time. After each item, an instruction appears, indicating that the participants should either continue to remember it or to forget it, because they will no longer be held responsible for it. After the list ends, participants are given a test of *all* of the to-be-remembered and to-be forgotten words. Interestingly, recall for to-be-forgotten words is often substantially impaired, relative to to-be-remembered items. For example, Basden and Basden (1996) observed worse recall for to-be-forgotten than for to-be-remembered items regardless of whether the items presented were pictures (78% versus 36% for remember and forget items, respectively), words (72% versus 46%), or words for which participants were asked to construct imagery (85% versus 42%).

Informatively, directed forgetting effects observed with the item method also occur on recognition tests (Basden, Basden, & Gargano, 1993). For these reasons, most theorists believe that item method directed forgetting effects reflect deficits in episodic encoding. If you were a participant in such a procedure, you would, in all likelihood, "hang on" to a word by phonological rehearsal, for example, until you knew whether it was to be remembered or to be forgotten. The *remember instruction* would trigger elaborate semantic encoding, whereas the *forget instruction* would give you permission to simply release the word from rehearsal. This finding illustrates one way in which people exercise control over what they permit into memory—by regulating whether a stimulus is granted elaborative processing. Mather and Carstensen's (2005) participants might have employed some version of this strategy, though their encoding was apparently deep enough to support subsequent recognition.

The *list-method directed forgetting* procedure presents the instruction to forget only after half of the list (often 10 to 20 items) has been studied, and usually as a surprise. Typically, deception is employed, in which the experimenter tells the participant that the list they just studied was for "practice," and that the real list is about to be presented. At other times, the experimenter might pretend that the participant had received the wrong list, which they should "forget about." Following this instruction, a second list is presented. A final test is then given, quite often for both lists, but

KEY TERM

Directed forgetting: The tendency for an instruction to forget recently experienced items to induce memory impairment for those items.

sometimes only for the first list. Participants are asked to disregard the earlier instruction to forget, and to remember as much as they can. Performance in this *forget group* is contrasted with a *remember group*, which follows the same procedure except that the instruction after the first list simply reminds people that they should continue remembering the first list. Two findings are observed consistently: First, when participants believe that they can forget the first list, they often do much better at recalling the second list on the final test, compared to the remember group. In other words, the proactive interference one finds from the first list often disappears when people believe that they can forget that list, providing a clear *benefit* of an instruction to forget. Second, "forget" instructions impair people's recall of items from the first list, compared to performance in the remember condition, reflecting a *cost* of a forget instruction. An illustration of the different varieties of directed forgetting is provided in Figure 10.2; a classic example of directed forgetting taken from a study by Geiselman, Bjork, and Fishman (1983) appears in Figure 10.3.

List-method directed forgetting effects exhibit interesting properties that distinguish them from effects observed with the item method. First, it is unlikely that participants use shallow encoding to forget first-list items. Participants do not receive any hint that they will have to forget anything until the entire first list has been studied, and so they have no motive to not encode effectively. Thus, list-method directed forgetting more likely

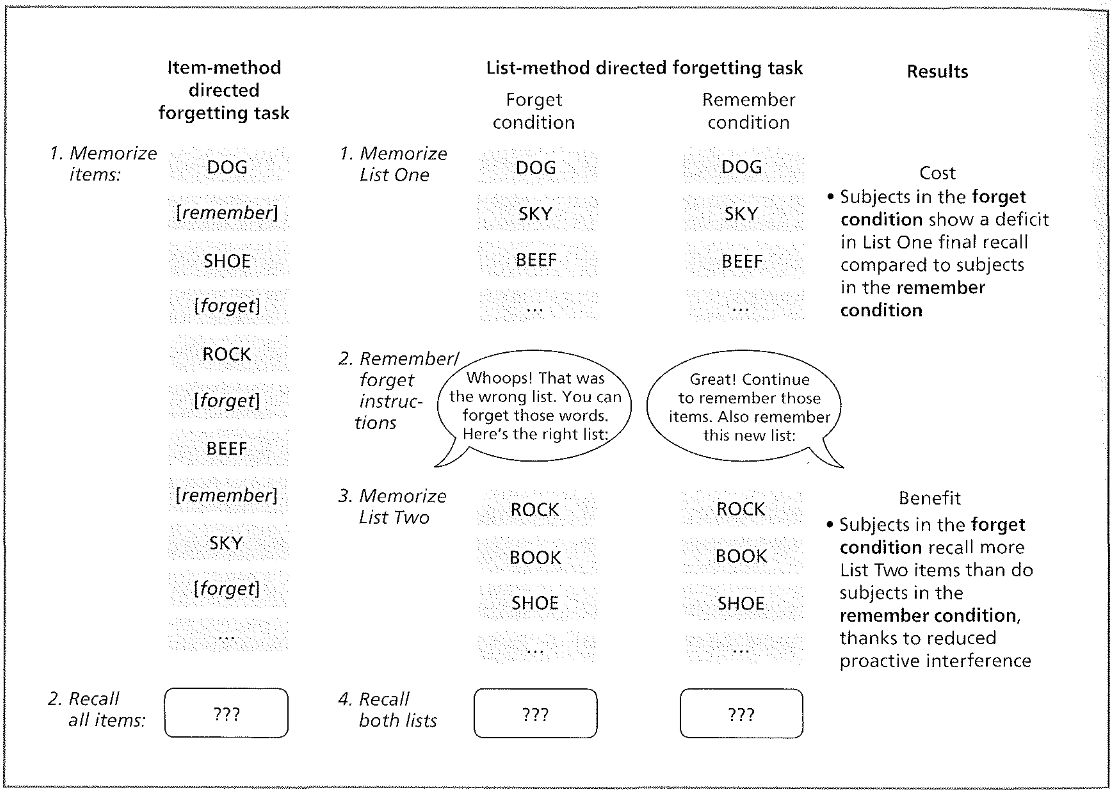

Item-method directed forgetting task
List-method directed forgetting task
Results
Forget condition
Remember condition
1. Memorize items:
DOG
[remember]
SHOE
[forget]
ROCK
[forget]
BEEF
[remember]
SKY
[forget]
...
2. Recall all items:
???
1. Memorize List One
DOG
SKY
BEEF
...
2. Remember/forget instructions
Whoops! That was the wrong list. You can forget those words. Here's the right list:
Great! Continue to remember those items. Also remember this new list:
3. Memorize List Two
ROCK
BOOK
SHOE
...
4. Recall both lists
???
Cost
• Subjects in the forget condition show a deficit in List One final recall compared to subjects in the remember condition
Benefit
• Subjects in the forget condition recall more List Two items than do subjects in the remember condition, thanks to reduced proactive interference

Figure 10.2 Item-method directed forgetting involves presenting items individually with an instruction, after each, to remember or forget. List-method directed forgetting presents many items before some participants receive an instruction to forget it and learn a second list. Memory is impaired for the first list in the forget condition; second-list performance is augmented.

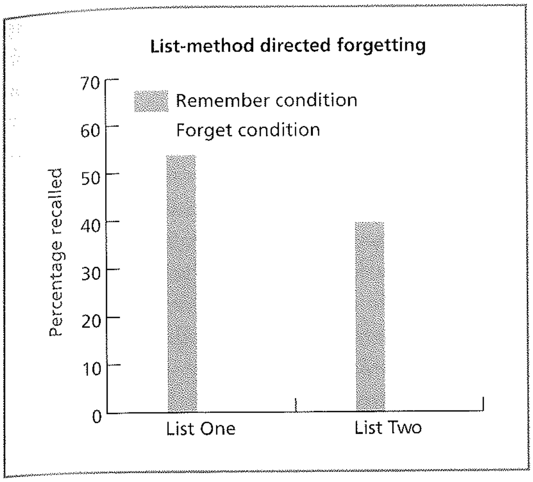


Figure 10.3 A classic example of results from a list-method directed forgetting experiment. Note that, relative to the remember condition, recall of List One is decremented in the forget condition, whereas List-Two recall is superior, thereby illustrating the cost and benefit of the instruction to forget. Data from Geiselman, Bjork, and Fishman (1983).

reflects a retrieval deficit. Consistent with this idea, list-method directed forgetting effects usually disappear when recognition is tested. Second, unlike in the item-method (Basden & Basden, 1996) items in the list method reveal their presence on implicit memory tests. Indeed, to-be-forgotten items can sometimes exert a greater influence on behavior when memory is tested implicitly. For example, Bjork and Bjork (2003) found that when some to-be-forgotten names were included on a later (apparently unrelated) *fame judgment test* presenting a set of famous and nonfamous names, to-be-forgotten (nonfamous) names were judged as more famous than were to-be-remembered (nonfamous) names in the remember condition. Presumably, participants had forgotten where they knew the name from, due to directed forgetting, and misattributed its familiarity to fame. This finding illustrates how Freud might not have been far off when he claimed that intentionally forgotten materials influence behavior outside of people's awareness.

List-method directed forgetting illustrates how, when people no longer wish to remember events, they can intentionally reduce their accessibility. Can such processes be engaged to forget more realistic personal experiences with emotional content? Susan Joslyn and Mark Oakes took a novel approach to this issue. They asked students to record in a diary two unique events that happened to them each day over a 5-day period (Joslyn & Oakes, 2005). Participants wrote a brief narrative and a title summarizing each experience, and they also rated the events for emotional valence and intensity. For example, one student recorded this event, entitled *Crow chase*:

> *A few friends and I were walking through campus when we suddenly saw a crow running around on the ground following a squirrel. It was so funny! We stood and watched them for a few minutes, exchanging funny squirrel stories and other animal stories. (Joslyn & Oakes, 2005, p. 4)*

After the first week of recording, students turned in their diaries. The forget group was told that the events recorded on the first 5 days would be used for a different study and that they should forget them, so that they could focus on events from the second week, which they would have to remember. The remember group was told that they would have to remember the events from the first week, as well as the ones from the upcoming week. Over the next 5-day period, the students then recorded a new set of events. After the second week ended, participants turned in their diaries and were then asked to remember all of the events they had recorded during both weeks. Joslyn and Oaks found that participants instructed to forget had poorer memory for events from the first week than did participants instructed to remember. This pattern was even observed for a group of "practice memories" that participants recorded in their first week that neither group believed they would have to recall. Interestingly, impairment was even found with negative and positive mood events. Related findings were observed by Amanda Barnier and colleagues (Barnier, Conway, Mayoh, &

Speyer, 2007) for personal memories learned outside of the experiment.

Mechanisms underlying list-method directed forgetting

Two leading theories can explain list-method directed forgetting. According to the **retrieval inhibition hypothesis**, an instruction to forget the first list inhibits list-one items, impairing recall. This inhibition does not, however, do permanent damage, and memories remain available. Inhibition merely limits retrieval by reducing activation of unwanted items. This view explains why intentionally forgotten items are difficult to recall, but can be recognized if we assume that re-presentation of forgotten items restores their activation levels. By contrast, according to the **context shift hypothesis** (Sahakyan & Kelley, 2002), instructions to forget mentally separate the to-be-forgotten items from the second list. If a person's mental context changes between the first and the second lists and if the second list context remains active during the final test, to-be-forgotten items should be recalled more poorly because the new context is a poor retrieval cue for them, similar to the notion of cognitive context discussed in Chapter 8.

To test the context shift hypothesis, Sahakyan and Kelley varied the mental context in between two lists of words. Might such a context shift produce the pattern observed in directed forgetting? In their context shift condition, participants encoded a first list of words and then performed a simple task designed to shift their "frame of mind." Participants were asked to imagine, for 1 minute, what their life would be like if they were invisible. The reasoning was that by performing such a bizarre task, participants would enter into studying the second list in a different mental context than was present while they were studying the first list (perhaps one in which they thought the experimenters were crazy). If the context shift hypothesis is correct, this simple manipulation should impair people's memory for the first list, even in the absence of any instruction to forget it. This in fact occurred: Participants given this context shift task showed much poorer retention of the first list on a later test. These findings suggest that part of the directed forgetting effect may arise from a shift in mental context induced by the intention to forget. This hypothesis is not inconsistent with retrieval inhibition, however, if mental context shifts are accomplished by inhibiting the unwanted context instead of individual items (Anderson, 2003). In either case, the deficit induced by instructions to forget (in laboratory studies) is produced by diminished access to the context in which forgotten events were encoded.

Research on directed forgetting establishes that people have some ability to forget intentionally. One method is to deprive experiences of elaborative encoding (item-method directed forgetting), increasing the chances that those memories will be forgotten quickly. The consequence of this method is a generalized deficit in recall or recognition, including diminished influence of the experience on indirect tests. Alternatively, unwanted memories can be rendered less accessible by a process that impairs access to the context to which the to-be-forgotten memories are associated. The to-be-forgotten items can continue to influence participants on indirect tests, suggesting that even in the absence of awareness, intentionally forgotten items might make their

KEY TERMS

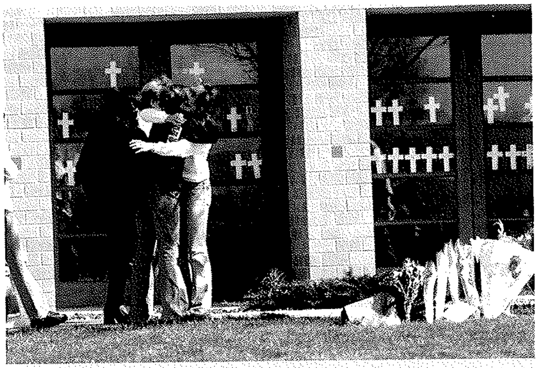
Retrieval inhibition hypothesis: A proposed mechanism underlying list-method directed forgetting suggesting that first-list items are temporarily inhibited in response to the instruction to forget and can be reactivated by subsequent presentations of the to-be-forgotten items.

Context shift hypothesis: An alternative explanation for list-method directed forgetting, positing that forget instructions separate first-list items into a distinct context, which unless reinstated during the final test will make the later context a relatively ineffectual retrieval cue.

presence known. Both item and list-method directed forgetting can impair neutral as well as emotionally negative materials.

Motivated context shifts and changes in stimulus environment

The preceding discussion illustrates how simply changing one's mental context (e.g. intentionally shifting to a new line of thought) can diminish access to past events. If changing mental context can induce forgetting, perhaps changing other elements of incidental context might work as well. People know this intuitively. For example, when something traumatic happens in one context, people avoid returning to that context to prevent from being reminded. If the location is a home or a town of residence, people will often change homes or towns to get over the unpleasant incident. When the unwanted memory concerns a person, people often avoid exposure to that person. If people cannot remove themselves from an environment, they will sometimes seek to change the environment itself. For example, in the aftermath of the fatal shootings at Columbine High School in Colorado, families of the victims lobbied to have the school library at which the shootings took place torn down and replaced with an entirely different structure, removing reminders to the horrible events.



Sometimes people are so motivated to control their memories that they alter the physical environment to remove retrieval cues. Such was the case at Columbine high school in Colorado. Following the shootings, families of the victims lobbied to demolish and rebuild the library where the incident took place. © Najlah Feanny/Corbis.

Motivated context shifts are likely to occur when it is too late to minimize encoding. To limit awareness of the memory, people avoid reminders. The avoidance of cues, especially shifts in environmental context, might facilitate normal forgetting processes in several ways. First, by avoiding reminders, the person deprives a memory of retrievals that ordinarily strengthen and preserve it (Erdelyi, 2006). Essentially, retrieval practice is prevented. Preventing reactivation of the trace should encourage decay processes, if they exist. Second, by changing environmental context, the incidental context within which one operates should mismatch the one in which the event took place, hindering retrieval. If the new context allows a person to recover, mood context will change, making spontaneous retrieval of the event less likely.

Intentional retrieval suppression

Sometimes we cannot avoid reminders to unpleasant events. When this happens, we only have two choices: be reminded or stop retrieval. To see how people might stop retrieval, consider the following example. Suppose that you have an argument with a significant other. The next time you see them, chances are you will be reminded of the argument, recreating the upset feelings. If you are motivated to "get past" the argument, and sustain a good feeling about the person, you might put the memory out of mind, especially if the argument was not of great consequence. You might find this difficult at first, requiring concentration to redirect your thoughts and emotions to more constructive ends. With repeated encounters, however, the remindings often grow less frequent. After much time, you might be unable to recollect the argument. Such forgetting is not a bad thing. Healthy relationships require at least some "forgive and forget." Without this, people dwell on small transgressions, never forgetting any upset or wrongdoing. AJ wishes that she could forget, because unpleasant memories trouble her long past the time when others would have succeeded in banishing them from mind. People often confront reminders to difficult memories that can make them sad, angry, anxious, or ashamed, and they quickly adjust their thoughts.

How do people suppress retrieval? To shed light on these issues, Collin Green and I considered an analogy between how people control unwanted memories and how they control action. We noted that unwanted memories have an "intrusive" quality, seeming to "leap" to awareness in response to reminders, despite our intention to avoid them. This reflexive quality seems similar to reflexive actions. Importantly, we clearly have the ability to stop physical actions. Consider a time that I knocked a potted plant off my kitchen windowsill. As my hand darted to catch the falling object, I realized that the plant was a cactus. Mere centimeters from it, I stopped myself from catching the cactus. The plant dropped, and was ruined, but I was relieved to have avoided being pierced with little needles. This illustrates the need to override a reflexive response to a stimulus. Without the capacity to override reflexive responses, we could not adapt behavior to changes in our goals or circumstances. If we can stop reflexive actions, perhaps we have the machinery to stop retrieval. Indeed, controlling retrieval may build on these mechanisms of behavioral control to achieve **cognitive control**.

People reflexively try to catch a falling object. But in certain situations (if the object is a cactus, for example), this prepotent motor response would be painfully inappropriate. We are fortunate to have the ability to stop ourselves in mid-action. Can we also stop ourselves from retrieving memories? © Tim Flach.

Retrieval suppression: Basic findings

How do we control reflexive actions? As discussed in Chapter 9, suppressing action can be accomplished by inhibition. Might suppressing retrieval be accomplished in the same way? To look at this, Collin Green and I (Anderson & Green, 2001) developed a procedure modeled after the go/no-go task, which is used to measure people's ability to stop motor responses. In a typical go/no-go task, people press a button as quickly as possible whenever they see a letter appear on a computer screen, *except* when the letter is an X, for which they are to withhold their response. The tendency to withhold the response measures inhibitory control over action (e.g. how well a person could avoid catching the cactus). To see whether people's attempts to stop retrieval might engage inhibitory control, we adapted this procedure to create the **think/no-think paradigm**.

The think/no-think procedure is intended to mimic those times in life when we stumble upon a reminder to a memory we would prefer not to think about, and try to keep it out of mind. In the simplest version, people study a set of cue-target pairs (e.g. *ordeal–roach*), and

KEY TERMS

Cognitive control: The ability to flexibly control thoughts in accordance with our goals, including our ability to stop unwanted thoughts from rising to consciousness.

Think/no-think (TNT) paradigm: A procedure designed to study the ability to volitionally suppress retrieval of a memory when confronted with reminders.

are then trained to recall the second word (e.g. *roach*) whenever they encounter the first word as a reminder (e.g. *ordeal*). By training pairs in this way, we hoped that the left-hand word would serve as a powerful reminder. In the next step, participants enter the think/no-think phase, which requires them to exert control over retrieval. Most of the trials require the person to recall the response whenever they see the reminder but, for certain reminders (colored in red), participants are admonished to avoid retrieval. So, for example, upon seeing the word *ordeal*, participants are asked to stare directly at this reminder, but nevertheless willfully prevent the associated memory from entering consciousness. It is emphasized that it is insufficient to avoid *saying* the response, and that preventing the memory from entering awareness is crucial. Can people recruit inhibitory control to prevent an unwanted memory from intruding into consciousness? If so, this procedure might capture the essence of repression, which, as Freud said, "Lies simply in the function of rejecting and keeping something out of consciousness" (Freud, 1917, p. 147).

Of course, we cannot observe people's conscious awareness, so it is difficult to know whether someone prevents a memory from entering consciousness. Instead, the think/no-think procedure measures the after-effects of stopping retrieval. If inhibition persists, perhaps stopping retrieval repeatedly might cause forgetting, much like how the memory of the argument grows less accessible with repeated encounters with your friend. To measure this behavioral footprint of suppression, participants receive the studied cues (*ordeal*) on a final test and are asked to recall the target memory (*roach*) for every one.

As Figure 10.4 reveals, there is a sizable difference in people's ability to recall "Think" and "No-Think" items on the final test. This difference, known as the *total memory control effect* (Anderson & Levy, in press; Levy & Anderson, 2008), illustrates how a person's intention to control retrieval alters retention. Exactly how intention influences performance is not clear from this effect alone, however. Including a third set of pairs that are studied initially, but that do not appear during the think/no-think phase (i.e. baseline items), allows us to measure the positive control effect, and the negative control effect.

The *positive control effect* can be seen in Figure 10.4 as the enhanced memory for "think" items above baseline recall, and is caused by intentional retrieval. This effect confirms that when people are inclined to be reminded, cues enhance memory. The *negative control effect* can be seen in the memory deficit for "no-think" items below baseline recall, and this is due to participants intentionally shutting down retrieval. Thus, when people avoid reminders, presenting cues triggers inhibitory processes that impair memory. The negative control effect is counterintuitive. Most people would expect that repeatedly encountering reminders would improve memory, but clearly this outcome depends on people's disposition as to whether they wish to be reminded. As can be seen in Figure 10.4, the negative control effect for no-think items is also seen when people are tested with a novel test cue, showing that impairment is cue-independent. As discussed in Chapter 9, this suggests that the item was inhibited.

Brain mechanisms underlying retrieval suppression

Might people really control intrusive memories in the same way they control overt action? Evidence for this possibility comes from neuroimaging studies assessing whether similar brain systems are involved in stopping retrieval and stopping action. For instance, with John Gabrieli, Kevin Ochsner, Brice Kuhl, and colleagues, I conducted a functional MRI study contrasting brain activity during no-think and think trials (Anderson, Ochsner, Cooper, Robertson, Gabrieli, Glover, et al., 2004). If suppressing retrieval engages mechanisms also involved in motor stopping, more activation should be found in those regions during no-think trials, in which stopping is required, than during think trials. Consistent with this hypothesis, suppressing retrieval

The think/no-think (TNT) paradigm

	Phase 1	Phase 2	Test phases	
Condition	*Study*	*Think/no-think*	*Same probe*	*Independent probe*
No-think	ORDEAL-ROACH	ORDEAL	ORDEAL-____	INSECT-R____
Think	STEAM-TRAIN	STEAM	STEAM-____	VEHICLE-T____
Baseline	RENT-WEEK		RENT-____	TIME-W____

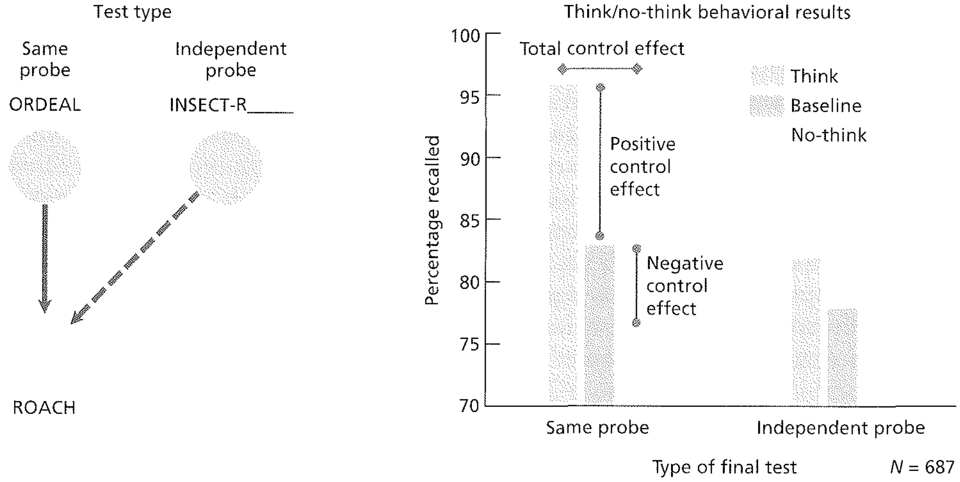


Figure 10.4 Top: After learning word pairs, participants in a think/no-think (TNT) experiment are asked to either think or not think about an item's associate. Participants' memory for all items is then assessed. Lower left: A depiction of the two types of final tests. Lower right: Results of a TNT meta-analysis by test type.

recruited a network of brain regions including left and right lateral prefrontal cortex, and anterior cingulate cortex. This network overlaps strongly with that involved with motor inhibition, even though no motor responses were required. The lateral prefrontal cortex plays an especially critical role in stopping reflexive motor action (e.g. Aron, Fletcher, Bullmore, Sahakian, & Robbins, 2003). In fact, stimulation of this brain region during a "go" motor response induces monkeys to stop their movement (Sasaki, Gemba, & Tsujimoto, 1989). This overlap confirms the idea that stopping unwanted actions and memories engages a common inhibitory process.

But how might our memories be controlled? The answer lies in the brain region that appears to be targeted by control: the hippocampus. The hippocampus is essential for forming episodic memories (Squire, 1992c), and increased hippocampal activation has been linked in prior neuroimaging studies to a person's subjective experience of consciously recollecting an event. Suppressing an unwanted reminder requires that people stop memory retrieval so as to prevent conscious recollection. If people seek to prevent conscious recollection, then perhaps retrieval suppression might reduce hippocampal activity. Indeed, Anderson et al. (2004) found reduced hippocampal

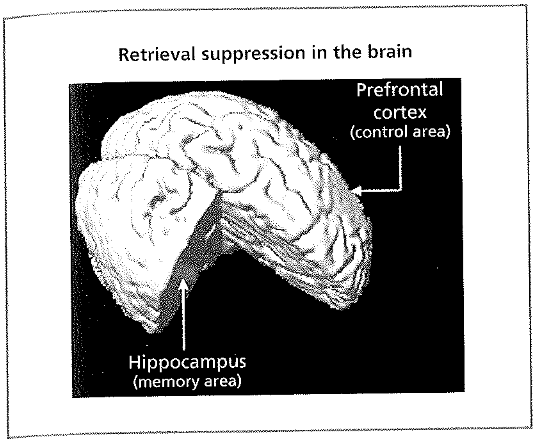

Retrieval suppression in the brain
Prefrontal cortex (control area)
Hippocampus (memory area)

Figure 10.5 A rendering of the neuroimaging results of Anderson et al. (2004). The lateral prefrontal cortex (depicted in green) is recruited during no-think trials to suppress neural activity in the hippocampus (in red), thereby preventing unwanted memories from coming to mind.

activity when participants suppressed retrieval, indicating that people can intentionally regulate hippocampal activation to disengage recollection (Figure 10.5). Thus, depending on whether people wish to be reminded by a cue, they are able to control hippocampal activation, influencing later retention.

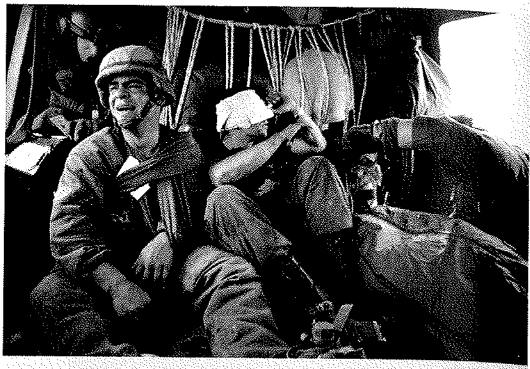
Can such mechanisms be effective for more complex emotional memories? Recent studies indicate that suppressing retrieval of negative memories causes as great or greater inhibition, relative to suppressing either neutral traces (Depue, Banich, & Curran, 2006; Depue, Curran, & Banich, 2007) or positive traces (Joormann, Hertel, Brozovich, & Gotlib, 2005). Effective suppression has even been observed when people suppress aversive scenes. In two studies by Brendan Depue, Marie Banich, and Tim Curran (2006, 2007), participants learned to pair certain unfamiliar faces with unpleasant scenes. For example, one face might have served as the reminder for a scene of a bad accident and another might have been paired with a badly deformed infant. Depue and colleagues found that presenting the face reminders and asking people to suppress retrieval impaired later recall of the aversive pictures, replicating negative control effects observed with word pairs. Depue et al. (2007) also replicated the activation of the lateral prefrontal cortex and the reduced hippocampal activity during "no-think" trials. Thus, inhibitory control appears effective at suppressing more naturalistic memories, suggesting it may be a fruitful model for how people regulate awareness of unpleasant memories.

It appears that when people want to not "catch their mental cacti" and avoid an unwelcome reminding, they engage systems that are also necessary for motor stopping. The difference between motor and memory control appears to be the area of the brain influenced by control; with motor inhibition, motor areas are modulated by lateral prefrontal cortex, but with memory inhibition, people instead "close down memory lane" by down-regulating activation in the hippocampus (Anderson & Weaver, in press).

Extreme emotional distress

Perhaps amongst the most striking and unusual form of motivated forgetting arises in *psychogenic amnesia*. Consider the dramatic case of AMN, a 23-year-old insurance worker (Markowitsch, Kessler, Van Der Ven, Weber-Luxenburger, Albers, & Heiss, 1998). AMN discovered a small fire in his basement and left the house to call for help. He did not inhale smoke, and he smashed the cellar door and immediately ran out of the house. That evening, he appeared dazed and frightened, and the next morning, when he awoke, he no longer knew what his profession was or where he lived. After 3 weeks, he entered the hospital. On examination, it became clear that his memories extended only until the age of 17. He barely recognized his partner, whom he had known for 3 years, and did not recognize his friends or co-workers. After 3 weeks of therapy, he reported one of his earliest memories as a child: at the age of 4, he saw a car crash, which set another car in flames; he was then witness to the driver's screams and his death in the flames, with his head pressed against the window. Since that time, fire had been AMN's worst fear. Despite this, AMN showed normal psychological and physical development and, throughout his life, showed no evidence of psychological illness. A full examination revealed no obvious evidence of brain damage, although greatly reduced metabolism was discovered in memory-related areas. Eight months later, at the time of the report, AMN's deficits in personal memory remained.

Cases like this illustrate several characteristics of psychogenic amnesia. First, psychogenic amnesia is triggered by severe psychological stressors. For AMN, a particular event makes contact with a trauma and triggers a massive reaction. The stressful event can cause a profound loss of personal memories, often despite a lack of observable neurobiological causes. In striking contrast, memory for public events and general knowledge is often intact. Unlike in AMN's case, amnesia can be *global*, in that it affects the entirety of a person's history. Indeed, in a form of psychogenic amnesia known as **psychogenic fugue** state (Hunter, 1968), people forget their entire history, including who they are. In such cases, people are often found wandering, not knowing where to go or what to do. Triggering events include such things as severe marital discord, bereavement, financial problems, or criminal offense. A history of depression and also head injury make a person more vulnerable to fugue states, when coupled with acute stress and trauma. Fugue typically lasts a few hours or a few days and, when the person recovers, they remember their identity and history once again. However, they often have persisting amnesia for what took place during the fugue.



Members of the military, like many nonuniformed individuals, suffer unimaginable traumas all too often. Such events have the potential to spark psychogenic amnesia, in which memories for the trauma become inaccessible. © David Turnley/Corbis.

Functional amnesia can also be situation specific, with the person experiencing severe memory loss for a particular trauma. Committing homicide; experiencing or committing a violent crime such as rape or torture; experiencing combat violence; attempting suicide; and being in automobile accidents and natural disasters have all induced cases of situation-specific amnesia (Arrigo & Pezdek, 1997; Kopelman, 2002a). As Kopelman (2002a) notes, however, care must be exercised in interpreting cases of psychogenic amnesia when there are compelling motives to feign memory deficits for legal or financial reasons. However, although some fraction of psychogenic amnesia cases can be explained in this fashion, it is generally acknowledged that true cases are not uncommon. Both global and situation-specific amnesia are often distinguished from the organic amnesic syndrome (discussed in Chapter 11) in that the capacity to store new memories and experiences remains intact.

Given the dramatic nature of memory loss in such cases, there is usually a concerted effort to help the person recover their identity and history. Deliberate attempts to remind the person of his/her past and identity rarely work, however. Memories can sometimes be recovered spontaneously when particular cues are encountered (Abeles & Schilder, 1935; Schacter, Wang, Tulving, & Freedman, 1982).

KEY TERM

Psychogenic fugue: A form of psychogenic amnesia typically lasting a few hours or days following a severe trauma, in which afflicted individuals forget their entire life history, including who they are.

For example, Kopelman (1995) reported a patient who spontaneously recalled, on seeing the name of an author on the spine of a book, that he had a friend who was dying of cancer who shared that name. Although some patients appear to recover spontaneously or with supportive therapy, Kritchevsky, Chang, and Squire (2004) found that only two of the ten patients they studied recovered fully, even 14 months after onset. Clearly, the conditions under which memories can be recovered need to be more fully understood.

FACTORS THAT PREDICT MEMORY RECOVERY

As the preceding discussion highlights, people can be motivated to forget at one time but then wish to recall forgotten memories later. Although the need for recovery is dire in psychogenic amnesia, it is also an important goal in less dramatic instances of forgetting. At some point, you need to face that unpleasant task that you keep suppressing; to do so, you need to extract it from memory when making your to-do list. Or you might encounter people who remember some embarrassing event that occurred to you that you simply cannot recall (like knocking over a Christmas tree) and, in your astonishment, might seek to release it from the dungeons to which it has been banished. Perhaps you are undergoing therapy and need to discuss past experiences. In this section, we consider factors that predict when motivated recovery can occur.

Passage of time

The passage of time is, of course, associated with forgetting. In some cases, however, memory paradoxically improves with delay even when no effort to retrieve is made. The classic demonstration comes from Ivan Pavlov, in his studies of classical conditioning. Pavlov found that when a classically conditioned salivary response was extinguished, the response gained in strength again after 20 minutes (Pavlov, 1927). Pavlov referred to this finding as **spontaneous recovery**. Spontaneous recovery is a robust phenomenon (Rescorla, 2004), including in research on conditioned emotional responding. After a conditioned response has been extinguished, spontaneous recovery increases with time, although conditioned responses do not generally return to full strength. Moreover, with repeated recovery/extinction cycles, the conditioned response recovers less each time. Spontaneous recovery illustrates that some types of memory, when seemingly forgotten, can once again return unbidden.

Similar findings have been observed for declarative memory. The idea that memory might improve over time originated in research on retroactive interference and was premised on an analogy between retroactive interference and extinction in conditioning (Underwood, 1948). In particular, according to the unlearning hypothesis discussed in Chapter 9, whenever a "response" is retrieved by accident, the association between the cue and the mistaken response is punished via a process akin to extinction. If so, retroactive interference should dissipate. Consistent with this hypothesis, Underwood (1948) found significant retroactive interference at short delays but performance on the first list improved at longer delays. Spontaneous recovery has been observed in a large number of retroactive interference studies since that time (see Brown, 1976, and Wheeler, 1995, for reviews).

Mark Wheeler (1995) reported several nice illustrations of spontaneous recovery in episodic memory. In one study, Wheeler presented students with twelve pictures, giving them three opportunities to study the items.

KEY TERM

Spontaneous recovery: The term arising from the classical conditioning literature given to the reemergence of a previously extinguished conditioned response after a delay; similarly; forgotten declarative memories have been observed to recover over time.

The students were then told that the list had been for practice, and that the real lists would begin. They then received two additional lists of twelve pictures, with a free-recall test occurring after each. After the third list was presented, students were given a free-recall test for the pictures studied on the first list either immediately, or after about 30 minutes. As can be seen in Figure 10.6, recall from the first list suffered significant retroactive interference from learning two intervening lists, compared to a control group who performed irrelevant distractor activities instead of learning second and third lists. Notice, however, that after about 30 minutes, free recall of the first-list pictures actually gets better. Wheeler demonstrated the same effect with lists of categorized words, and also with word pairs, showing that recovery is general. Although most studies of spontaneous recovery have examined intervals up to 30 minutes, some have found recovery after several days. The stronger memories are, the more likely they will be to exhibit recovery (Postman, Stark, & Henschel, 1969).

Why does episodic memory improve over time when the overwhelming majority of research indicates the opposite relationship? One feature shared by spontaneous recovery in both classical conditioning and episodic memory is the explicit rejection of particular responses that had previously been relevant. As discussed earlier, the need to stop unwanted responses is one of the main conditions thought to engage inhibition. If retroactive interference reflects the persisting effects of inhibition, perhaps forgotten items recover because inhibition is gradually released. Thus, the factor that differentiates when memory

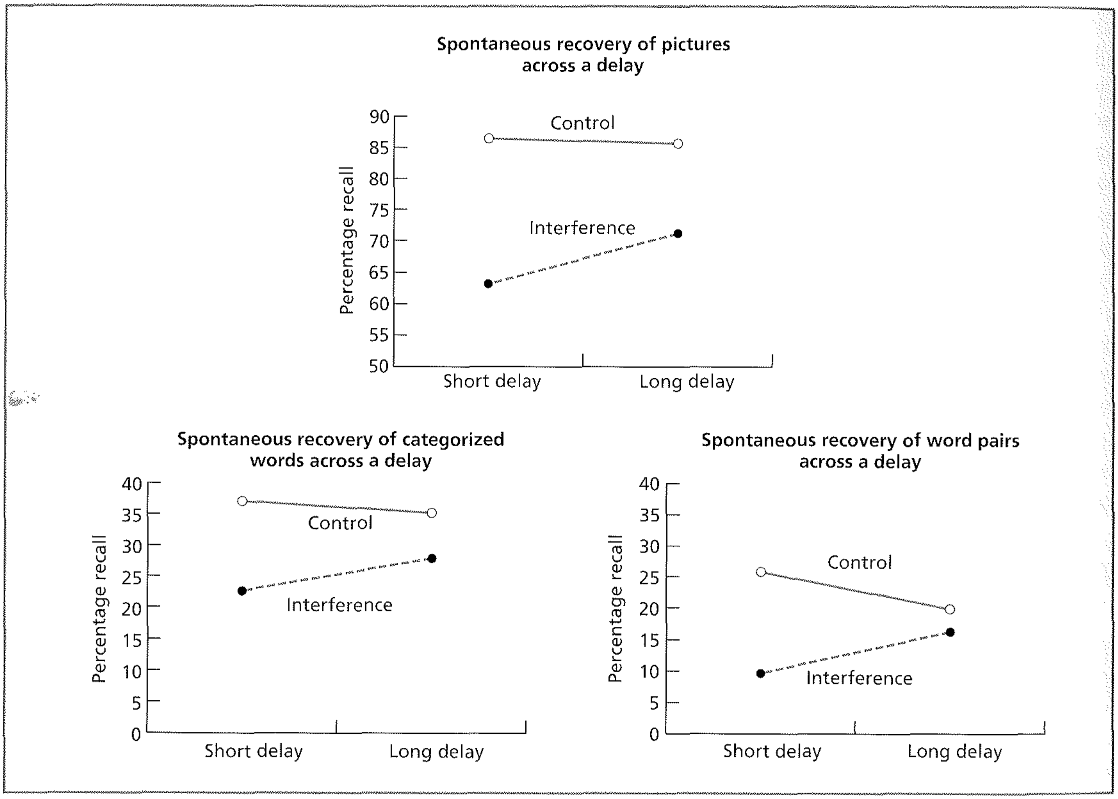


Figure 10.6 A series of experiments conducted by Wheeler (1995) demonstrating that the retroactive interference produced by intervening lists of pictures, words, or word pairs observed at short delays is diminished after a longer delay. Note that memory for items in the interference condition improves with delay in each case. From Wheeler (1995). Copyright © American Psychological Association. Reproduced with permission.

will improve and when it will decline may be the involvement of inhibition. Consistent with this, Malcolm MacLeod and Neil Macrae (2001) found that retrieval-induced forgetting was significantly reduced after a 24-hour delay, suggesting that in some cases inhibition might dissipate over time. Given the tendency for emotionally unpleasant experiences to come back and haunt us, even after frequent suppression, spontaneous recovery seems likely to be a force behind the reappearance of forgotten traces.

Repeated retrieval attempts

After a long struggle trying to recall an experience, is it worth continuing to search even when your intuition tells you that there is nothing to be recalled? Doesn't that feeling mean that the event has been lost forever? Perhaps not. Consider my experience trying to remember the location of my passport (described at the start of Chapter 8). After strenuous effort, I had no recollection whatsoever of storing this item, and felt that I would never remember. Yet the moment I found it, I instantly recalled placing it in that location, showing that the memory was there. On the contrary, my efforts to remember knocking over the Christmas tree discussed in the last chapter have proven fruitless, despite prolonged recall attempts, stretching over months. When you fail to recall numerous times, doesn't it mean that the memory will not be recovered?

Interestingly, the answer to this question often is "no." Repeated retrieval attempts typically increase the amount recalled, even when the person feels that he/she cannot recall more. This phenomenon was first discovered by Ballard (1913), who asked young schoolchildren to memorize poetry. Over successive recalls, Ballard found that the children would often recall new lines of poetry that they had failed to recall previously. Ballard referred to this phenomenon as **reminiscence**, which he defined as, "the remembering again of the forgotten without relearning" or "a gradual process of improvement in the capacity to revive past experiences" (Ballard, 1913). Ballard noted that even when the overall number of lines of poetry did not increase across retrievals, students often included newly recalled lines in later attempts not present in earlier ones. Overall recall sometimes didn't improve, however, because the benefits of recalling new lines were countered by students' failures to recall lines previously recalled. Nevertheless, often the amount of reminiscence exceeded this intertest forgetting, yielding improvement overall. When overall recall improves through repeated testing (when reminiscence exceeds inter-test forgetting), a person has exhibited **hypermnesia**, a term introduced by Mathew Erdelyi to contrast this with the amnesia normally arising from the passage of time.

Although neglected for decades, Mathew Erdelyi and colleagues revived interest in this phenomenon in a series of striking demonstrations. In an amusing example, Erdelyi tricked a psychology PhD student, Jeff Kleinbard, into becoming a participant in a week-long study of hypermnesia. The student was interested in pursuing research on hypermnesia. To help him get a feel for the phenomenon, Erdelyi had Kleinbard join participants in a testing session. Participants studied 40 line drawings of objects. Participants then spent 5 minutes recalling as many of the pictures as possible (by writing the name of the object) on a blank sheet with 40 lines. If they could not recall all 40 items, the students were required to make educated guesses about what the remaining unrecalled pictures might be. This testing procedure continued for 5 recall attempts. When Kleinbard went to Erdelyi's office to score his recall, Erdelyi challenged him to continue his recall efforts over an entire week—a challenge that Kleinbard accepted. Each day, Kleinbard filled out recall sheets as many times as he

KEY TERMS

Reminiscence: The remembering again of the forgotten, without learning or a gradual process of improvement in the capacity to revive past experiences.

Hypermnesia: The improvement in recall performance arising from repeated testing sessions on the same material.

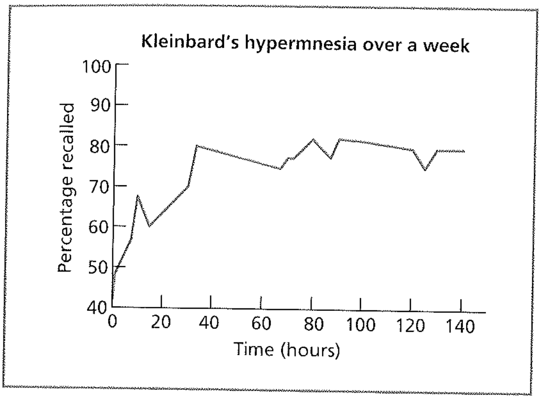


Figure 10.7 The recall data of an unwitting participant in an investigation of hypermnesia. Repeated retrieval attempts over a period of about a week led to a striking improvement in the percentage of pictures recalled. Data from Erdelyi and Kleinbard (1978).

cared to. When done, he inserted each sheet into an envelope and did not review them again. As can be seen in Figure 10.7, Kleinbard's total recall improved dramatically over the testing days, starting at 48% on the first day and rising to 80% by the final day. Indeed, when one considers his cumulative recall (i.e. giving him credit for each item recalled at any point up until and including a given test), Kleinbard's recall went from 48% to 90%. This occurred despite the fact that, on the first day, Kleinbard had tried his hardest to recall as many items as possible. Thus, Erdelyi and Kleinbard had essentially reversed Ebbinghaus's forgetting curve, by which memory gets progressively worse over time.

How might hypermnesia come about? Kleinbard stated that one of the most important factors was by visualization and reconstruction. In his own words:

> *By far, the most interesting subjective experience was getting a general "visual feeling" in my mind for a particular shape such as a length or roundness. I remember seeing a vague, oblong shape in my mind from which I was able to extract such items as gun, broom, and baseball bat; from an oval shape—football and pineapple; from an inverted cup form—bell, funnel, and bottle (the bottle in the stimulus resembled a bell-jar); from a rectangular box—table and book. Just before many of these recoveries, I often experienced what might best be described as a "tip-of-the-eye" phenomenon, in which I was certain a particular item was on the verge of recovery but which would take its time before suddenly coalescing into an image in consciousness. (Erdelyi & Kleinbard, 1978, p. 280)*

Erdelyi and Kleinbard (1978) found the same pattern with a group of six additional participants, three of whom studied pictures and three of whom studied words. Participants who studied words, however, showed more modest hypermnesia than those who studied pictures, suggesting that imagery plays an important role in determining whether traces can be unearthed with repeated recall. Indeed, several participants noted "tip-of-the-eye" experiences much like that of Kleinbard.

Hypermnesia is a robust phenomenon, and can be observed in simple laboratory sessions lasting less than an hour (Payne, 1987). Hypermnesia is largest on free recall tests, but has been found on cued recall and recognition tests. The effect has been found with both verbal and visual materials, although effects are consistently larger with imageable materials. Of course, hypermnesia increases with increasing numbers of recall tests, and several investigations indicate that this effect does not simply reflect increases in time *per se*, as giving a single long test often does not yield as much benefit as many repeated tests. Nor does hypermnesia seem to reflect participants guessing more loosely as time goes on, because the frequency of false recalls often does not go up with repeated testing.

But can hypermnesia be found with complex, realistic memories? In one interesting illustration, Susan Bluck, Linda Levine, and Tracy Laulhere (1999) studied memory for a public event that many people had witnessed, and for which objective verification of details was possible: the televised reading of the verdict in the OJ Simpson murder trial. The reading of the verdict took place at 10.04 a.m. on 2 October 1995 in Los Angeles. The 14.5-minute proceeding was televised by a single courtroom camera shared by all television networks. Eight months after the verdict had been televised, Bluck et al. recruited people who viewed the coverage and asked them to remember as much as they could, including details that occurred before, during, and after the reading of the verdict. Participants were interviewed three times in a row to obtain their complete recollection of every detail. Within each interview, participants were prompted several times with requests for further details, making sure that they had recalled everything they could. Significant hypermnesia occurred, with the number of verifiable details remembered increasing from 27% to 52% across the three attempts.

But can hypermnesia occur for memories that people have deliberately tried to forget? On the one hand, the motivation to not remember might engage processes that have a special impact, making memories difficult to recall. Moreover, the same motivational factors that led to the memories being forgotten might also come into play during retrieval, undermining recovery. On the other hand, if someone decides to remember something he/she had previously tried to forget, might the change in disposition undo avoidant tendencies, and render forgotten material subject to hypermnesia? I might initially have been motivated to not think about knocking over the Christmas tree, but my motivations certainly changed years later. Although research examining hypermnesia for intentionally forgotten memories is rare, several studies using the directed-forgetting procedure demonstrate that hypermnesia does occur for intentionally forgotten items (Goernert & Wolfe, 1997; Goernert, 2005).

It is natural to worry whether repeated retrievals might introduce persisting errors that come to be attributed to actual experience. In a nice illustration, Linda Henkel (2004) showed participants slides that contained either line drawings with their names (e.g. an image of a lollipop, plus the word *lollipop*), or simply the names with no picture. For each slide, participants were asked to think of functions of the object, and when a drawing was absent, to try to visualize a typical example. Participants then received three recall tests. Participants exhibited robust hypermnesia, but also showed an increase in source misattribution errors. With each test, participants grew more likely to falsely claim that they had seen an image of an object that they had only imagined. This tendency was especially likely when participants had seen physically or conceptually similar objects on the list. However, the overall rate of erroneous recalls is often surprisingly low, compared to accurate recall, in studies examining repeated recall of emotional eyewitness events (Bornstein, Liebel, & Scarberry, 1998) or autobiographical memory (Bluck et al., 1999).

Cue reinstatement

After putting unwanted memories out of mind, we sometimes stumble upon reminders. Walking around a corner, you might see a car matching the model your former partner used to drive. Rummaging through a box, you might find a gift from a loved one who has died. Veterans of Iraq who see someone make a sudden movement alongside the road while driving might be transported back to the roadside bomb attack they experienced. Unintended reminders illustrate the power of cues to reinstate unwanted memories. Cues have the same power, of course, when one reverses course, and intends to remember something that one previously wished to forget.

Steven Smith and Sarah Moynan (2008) compellingly demonstrated how people might come to forget and then later recover experiences, given the right cues. Very often one needs to confront reminders of unpleasant experiences on a recurring basis. One way of handling this might be to think about or discuss only some aspects of the experience while avoiding the unpleasant parts, perhaps rendering the nondiscussed elements less accessible. To simulate this, Smith and Moynan presented people with a categorized word list. The 21 categories included things such as *furniture*, *fruit*, *drinks*, but also emotional categories like *disease*, *death*, and *gross*. Following encoding, the experimental group made judgments about the examples from 18 of the 21 categories, three times each, encouraging selective reprocessing of parts of the list. In the control group, the same time was spent on irrelevant tasks. Participants were then asked to recall all of the category names, including ones that were left out of the intervening phase. As can be seen in the top portion of Figure 10.8, participants exhibited truly remarkable forgetting of the three category names omitted from the intervening phase. Importantly, this occurred even when categories involved emotional items such as curse words or words concerning death. In some cases, recall of the avoided categories was 70% lower than the control group, despite comparable delays and demands on attention in the intervening phase. Clearly, biasing attention to certain elements of an experience can induce dramatic rates of forgetting.

What happened to the forgotten items? Participants in the experimental condition clearly had difficulty recalling the omitted categories. If asked, they might feel as though they could not recall any more. Smith and Moynan (2008) showed that this was not true, however. After participants tried to recall the categories, they were given the category names, in turn, and asked to recall the examples. As can be seen in bottom of Figure 10.8, once the category names were given, the control and experimental participants recalled exactly the same number of items per category, and recalled these at a very high rate. Thus, retention of the items was preserved, once the right cue appeared. Indeed, of the 10 "death" words experimental participants had encountered, they recalled nearly 60% (an amount identical to that recalled by the control group) when cued with the category, even though moments earlier only 10% of the participants could even recall seeing death words on the list (compared with 70% of the participants in the control condition). This illustrates that unpleasant experiences can sometimes be forgotten, given the right motivated biases in reminiscing about the event, and later recovered, given the right reminders.

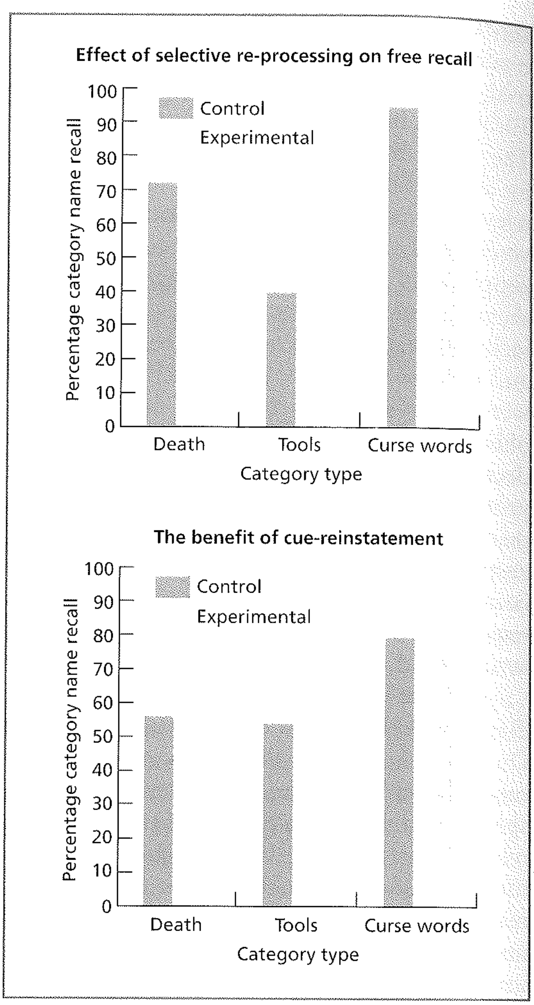


Figure 10.8 Smith and Moynan (2008) asked participants to selectively review a subset of categorized word lists. Top: The free-recall test revealed forgetting for nonreviewed categories. Bottom: Exemplars from categories participants failed to generate during free recall could often still be retrieved using category cues. From Smith and Moynan (2008). Copyright © Blackwell Publishing. Reproduced with permission.

But can cues really help recover memories that were intentionally forgotten? In one example, Goernert and Larson (1994) found that directed forgetting could be "released" by simply presenting a subset of the items participants studied on the first list as cues. Without any cues, participants showed a directed forgetting effect, with those people instructed to remember recalling 44% of the first list words, and those instructed to forget recalling only 21%. If participants were given either four or eight cues, their first list recall increased to 29% and 31%, respectively. Of course, the potency of cueing is also shown when people receive to-be-forgotten items on a recognition test, in which directed forgetting effects are not usually observed (with the list-method). Seeing the item itself is a potent reminder, much like seeing a videotape of an experience we have tried to forget would prove an alarmingly effective cue.

Reinstating context can also help to recover memories intentionally forgotten. For example, Sahakyan and Kelley (2002) showed that reinstating mental context can undo the effects of instructions to forget in the list-method directed forgetting procedure. Participants were exposed to an unusual context just prior to encoding the first list of words: the presentation of the theme from the Star Wars® soundtrack. Later, on the final test, Sahakyan and Kelley asked participants to reinstate the mental context that they had been in upon entering the room, including anything that they could remember about how they felt or what they thought. Would reinstating the incidental context bring back intentionally forgotten material? When the context was not reinstated, participants showed a 22% deficit in the forget condition compared to the remember condition. The context-reinstatement group, however, showed only an 8% directed forgetting effect. These findings demonstrate that motivated forgetting processes often reduce the accessibility of unwanted memories, but do not alter their availability in storage. Often, these memories remain, awaiting a time when they are sought and when the right cues are available. One question that arises is whether experiences can reside in memory, untouched and inaccessible, and be reinstated after a long delay, given the right cues. Next, we consider an important societal issue on which our understanding of these processes bear, and illustrate recovery in real life.

RECOVERED MEMORIES OF TRAUMA: INSTANCES OF MOTIVATED FORGETTING?

Most people have heard stories in which a person claims to have recovered a memory of a deeply unpleasant event, after years of being unaware of it. Sometimes famous cases receive media attention because they have led to legal charges of childhood sexual abuse against priests or parents. At other times, fictionalized cases appear on television or film, with a recovered memory as a plot device. Some people hear about recovered memories through friends or family who have had such experiences. As a memory instructor for many years, I have been approached by many students claiming to have recovered memories of abuse (several times a year). The idea that people can repress disturbing experiences is a central tenet of psychoanalytic theory. Indeed, many therapists would say that they routinely see repression and recovery in their clients. Can an unpleasant experience be forgotten and then recovered years later?

There are excellent reasons to be cautious in interpreting such reports. Retrieval is imperfect. When people have difficulty remembering, they might engage in reconstruction and inference that adds things to memory that might not have taken place. Moreover, people often confuse the sources of their memories, frequently failing to distinguish things that they have imagined, heard about, read, dreamt, or seen in a movie with things that truly happened. The dangers of such possibilities grow when people participate in therapies that have, as their objective, the goal of uncovering repressed memories. The use of hypnosis, guided imagery, and other suggestive techniques can create an environment in which it is difficult to discern fact from fiction. The cost of a memory error might be the accusation of a family member of childhood abuse when none has occurred.

The possibility of false memories, and concern over their consequences, does not, however, imply that recovered memories are untrue. One should place equal emphasis on the possibility that such experiences might reflect true events, and that failure to acknowledge this will have consequences for the victim and others who could suffer abuse at the hands of the perpetrator. In this section, we consider whether recovered memories are real and, if so, how often, how people have sought to establish these facts, and the possible mechanisms by which such experiences might come about. We begin by describing several case reports in which the memory recovery experience came about in different ways.

Cases of recovered memories

The following are real recovered memory cases, although the names have been changed. In Case 1, a person recovers a memory gradually, in suggestive therapy. Case 2 recounts a woman who abruptly remembered an abuse memory, outside of therapy, when confronted with powerful reminders. Case 3 is the story of a woman who recovered a series of deeply unpleasant events outside of therapy, and who, as a result, sought therapy.

Case 1

As reported by Geraerts (2006), Elizabeth Janssen became very depressed. Her marriage was falling apart and she even quit her job for a while. Elizabeth and Carl went to a marriage counselor to solve their problems. After several sessions, the therapist referred them to a colleague because she could not figure out why they stopped caring for each other and why their sex life was unsatisfactory. Elizabeth and Carl then started individual therapy with this psychiatrist. Almost immediately, Elizabeth was diagnosed with a major depressive disorder. She was told that she had to uncover her repressed memories of early childhood abuse, as this was the underlying cause of her disorder.

At first, Elizabeth vehemently denied having been abused, and certainly not by her beloved father, as her psychiatrist insinuated. Her psychiatrist insisted that a childhood trauma must have happened to her; he had seen the same symptoms in so many patients. He started using guided imagery, instructing Elizabeth to imagine scenes of the supposed abuse even though Elizabeth continued to deny, although less fervently, that she had such memories. Because no abuse memories were surfacing, Elizabeth was given books about child abuse survivors to read; she was told that if something felt uncomfortable while reading these books, this would indicate that similar things happened to her. To help Elizabeth remember the abuse, hypnosis was used. After 2 months of intense therapy, Elizabeth gradually recovered vivid images of being abused. She said that she could see herself lying in bed as her father came into her room at night. While she was very anxious, he performed terrible and painful sexual acts on her. "Yes, even penetration." These traumatic events allegedly continued until she went to boarding school at age twelve. Meanwhile, Elizabeth's husband Carl had been in therapy with the same psychiatrist. He was told that he also suffered from depression. After several weeks, Carl had recovered being sexually abused by several priests at boarding school.

When asked how she had felt after recovering these abuse memories, Elizabeth said that she had never felt such a relief. It turned out that not she, but her father, was responsible for her depression. She broke off all contact with her parents. Contact with her sister and brother also became infrequent because they did not believe her story.

Case 2

Another report by Geraerts (2006) describes Mary de Vries, who had been working in the hospital as a pediatric nurse. She had a happy marriage and a 3-year-old daughter. She had been very happy that, after several years of trying, she had finally become pregnant. However, the birth of her daughter, Lynn, elicited serious problems. When Mary came home with Lynn from the hospital, she felt uncomfortable when her husband was taking care of their baby. She almost never left him alone with their daughter; she always wanted to be there when he was washing her or changing her nappies. She really could not stand the thought of her husband doing something bad to Lynn. Her mistrust resulted in heavy arguments between the couple. Mary did not even know why she mistrusted him.

Almost at the same time, her mother fell ill. Her mother had been living alone on the coast since her second husband, Mary's stepfather, had left her. Mary reassured her mother and told her that she would come over for a couple of days with her baby and would help her with the housekeeping. While she was cleaning, she entered her former bedroom. Mary said that she suddenly had a complete recollective experience in which "a whole series of pictures were running through my head." The cascade of memories horrified, shocked, overwhelmed, surprised, and baffled her at the same time. Suddenly she remembered vulgar events that occurred in that room. She remembered that her stepfather had approached her several times while she was playing there. He had fondled her genitals several times. Mary just could not talk with her mother about these horrible memories. A few days later, when Mary got home, she called her sister. Mary told her what had happened at their mother's place. First, her sister said nothing. After a couple of minutes, she told Mary that she had always vividly remembered that she had been molested by their stepfather as well.

Case 3

Herman and Schatzow (1987) report the following case, which subsequently appeared in *Science News* (Bower, 1993). After losing more than 100 pounds in a hospital weight-reduction program she had entered to battle severe obesity, Claudia experienced flashbacks of sexual abuse committed by her older brother. She joined a therapy group for incest survivors, and memories of abuse flooded back. Claudia told group members that from the time she was 4 years old to her brother's enlistment in the Army 3 years later, he had regularly handcuffed her, burned her with cigarettes, and forced her to submit to a variety of sexual acts. Claudia's brother had died in combat in Vietnam more than 15 years before her horrifying memories surfaced. Yet Claudia's parents had left his room and his belongings untouched since then. Returning home from the hospital, Claudia searched the room. Inside a closet she found a large pornography collection, handcuffs, and a diary in which her brother had extensively planned and recorded what he called sexual "experiments" with his sister.

What do we make of such cases?

The previous cases make several important points. First, memories can be recovered in many ways. In some cases, memories are recovered gradually, through active search and reconstruction, sometimes targeted at remembering abuse the person is not sure ever occurred. In other cases, the experience comes to mind spontaneously, without active search. Memories are sometimes recovered outside of therapy, triggered by a compelling need to explain some powerful reaction or feeling. Indeed, of the 634 cases of recovered memories reported by a sample of 108 British clinical psychologists in study by Andrews, Brewin, Ochera, Morton, Bekerian, Davies, et al. (1999), 32% reported recovering their memories prior to therapy of any kind.

These cases also illustrate that corroboration is sometimes lacking. In Case 1, no evidence was produced to prove that the abuse had occurred, other than the conviction of the therapist and, eventually, of the patient. Nobody else in the person's family believed the story, nor did the patient herself prior to the insistence of the therapist. It is common for corroboration to be lacking, as the hypothetical event is usually thought to have taken place years earlier, outside the view of anyone other than the accuser, who, at the time of the event, is usually a child. In such cases, it is impossible to know whether corroboration is missing because the event is not real or because care was taken to conceal it. Corroboration has often been possible, however, as illustrated in the latter cases. Indeed, there any many cases of individuals recovering memories that have been objectively corroborated. These cases provide compelling proof of the phenomenon of recovery: It is possible to forget an emotionally significant event over many years and later recover it.

The cases also highlight a serious concern about reports of recovered memories. Case 1 illustrates that some reports come through therapeutic techniques that are overly suggestive. Elizabeth Janssen had no predisposition to believe that her father had abused her but her therapist was very insistent about it. In fact, the therapist appears eager to apply repression of abuse as a diagnosis. Despite her protests, Janssen was made to repeatedly imagine and try to remember abuse she did not believe occurred, in some cases under hypnosis. Only after all this did Janssen come to believe in the event. Although such repeated retrievals might have revealed real memories, as suggested by work on hypermnesia, it also seems possible that Janssen could no longer distinguish her previous imaginings from true memories, as suggested by the Henkel (2004) work discussed earlier. When a therapist has a conviction of a memory's reality, and a client starts to feel as though he/she is remembering (even if the remembering is of previous imaginings), it can become difficult to discount the possibility that the memory is real. Thus, some cases of recovered memories might be false memories unwittingly encouraged by therapists who intend to help the patient.

Differing origins of recovered memory experiences

The preceding discussion suggests that memories recovered under differing circumstances might be produced by different processes. On the one hand, memories recovered through suggestive therapy might be more likely to reflect suggestions by the therapist rather than true recovery. On the other hand, memories recovered spontaneously, outside of therapy or in therapy, without suggestion, might be more likely to be genuine. These memories could have been forgotten by any of the mechanisms outlined in this chapter. If so, corroboration should be more likely for memories recovered spontaneously than for memories recovered through suggestive therapy.

Recently, Elke Geraerts, Jonathan Schooler, Harald Merckelbach, and colleagues (2007) sought to corroborate abuse memories of people who have always remembered their abuse, and people who have recovered it. After filling out a questionnaire about their memory of the abuse, participants were queried about sources of corroboration. Independent raters, blind to the group in which a participant fell, used this information to seek evidence that would corroborate the event. A memory was considered corroborated if: (1) another individual reported learning about the abuse within a week after it happened; (2) another individual reported having been abused by the same perpetrator; or (3) the perpetrator admitted to committing the abuse. Strikingly, memories recovered spontaneously, outside of therapy, were corroborated at a rate (37%) that was comparable to that observed for people with continuously accessible memories (45%). Memories recovered through suggestive therapy, however, could never be corroborated (0%). Although this lack of corroboration does not imply that those recovered memories are false, the lack of evidence does not permit confidence in their reality, and recommends caution in interpretation. More generally, these findings suggest that not all recovered memories are the same, and that discontinuous memory does not make an experience any less real than something a person has always remembered.

The foregoing findings suggest that recovered memories can originate in different ways for people who recollect the abuse spontaneously, and for those who recall it through suggestive therapy. Geraerts and colleagues hypothesized that memories recalled through suggestive therapy might be the product of suggestion, a possibility consistent with the lack of corroboration. People recalling memories spontaneously, by contrast, might genuinely have forgotten the experience, and later remembered it. Alternatively, the spontaneously recovered group might have recalled the event, but have forgotten that they have recalled it before. The latter possibility is suggested by a case reported by Jonathan Schooler (Schooler, Ambadar, & Bendiksen, 1997), in which a woman "recovered" a memory of childhood abuse for "the first time," only to be informed by her spouse that they had discussed the event at length years earlier. Might people who have spontaneous recovery experiences simply be forgetting prior occasions of thinking about it?

To explore these possibilities, Geraerts, Arnold, Lindsay, Merckelbach, Jelicic, and Hauer (2006) first investigated whether people reporting recovered memories had a tendency to underestimate prior remembering. They invited people with recovered or continuous memories to write down a memory from their childhood for each of 25 titles. The titles described common things that happen to children like *being home alone* or *going to the dentist*. For some of these titles, participants were asked to concentrate on emotionally negative aspects of the event (e.g. for *being home alone* this might be the feeling of being frightened), but for others, the positive aspects (e.g. for the home alone title, this might be getting to do whatever you want). Everyone returned 2 months later and generated the same memories, yet again. There was one switch, however: Sometimes people retrieved the events in the same emotional frame as before, but for other titles, they were asked to retrieve the event in the opposite emotional frame. So, for example, if they had recalled *being home alone* in a positive light during the first visit, they recalled the same event again, but focused on the negative aspects. When this second visit was complete, people returned to the laboratory for a third and final time 2 months later. They recalled all of the events yet again, but this time they recalled each one in the same emotional frame in which they had recalled it during the first visit. Critically, after recalling each memory, people were asked to remember whether they had recalled that same memory during the second (i.e. middle) visit. Interestingly, when the emotional framing on the final visit differed from the one on the second visit, people were quite like to forget having remembered the event during that second visit, compared to when the emotional framing remained the same. Thus, shifting the way that people thought about the same memory (whether positively or negatively) from one occasion to the next made them forget thinking about the memory before. Importantly, this tendency was much greater for people reporting recovered memories than it was for people reporting continuous memories, or people without any history of abuse (Figure 10.9).

So it seems that one reason why people might have a recovered memory experience is that they simply forget having remembered the event before. They might forget prior cases of remembering if, for example, the mental context present when they are having their recovery experience differs from the mental context on prior occasions in which they thought of the event. By this view, it is not that people have forgotten the event for all those years, it is that they simply can't remember having remembered, perhaps due to context-dependent memory.

If this process underlies authentic reports of recovered memories, then perhaps people who spontaneously recover their memories of childhood abuse would be more likely to show pronounced underestimation of prior remembering than would participants who recovered their memories through suggestive therapy. By contrast, if people who recover their memories through suggestive therapy are especially prone to suggestion, perhaps they might show an exaggerated tendency towards false-memory formation. To examine these possibilities, Geraerts and colleagues (in press) tested people with spontaneously recovered memories, people with memories

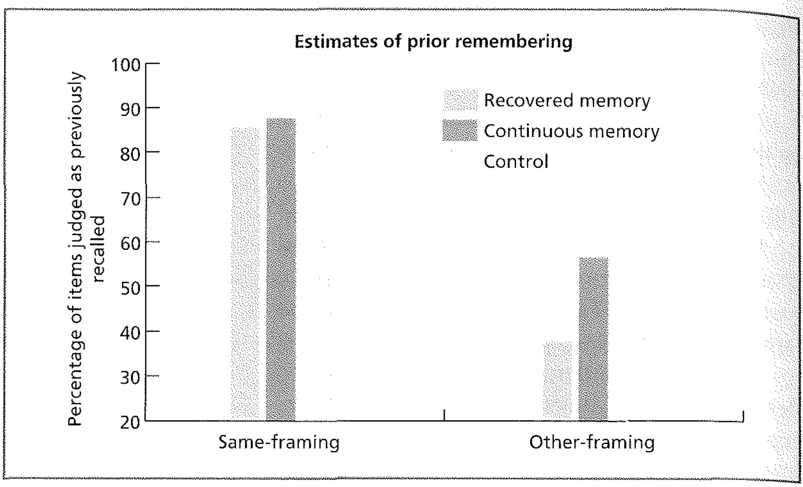


Figure 10.9 The ability to recall prior remembrances is diminished if the retrieval perspective differed between them (other-framing condition). Geraerts et al. (2006) found that this tendency is greatest in individuals who previously reported recovered memories of abuse, distinguishing them from abuse victims who reported continuous memories of their trauma and controls. Data from Geraerts et al. (2006).

recovered through suggestive therapy, and people with continuously available memories on the preceding task. Strikingly, only participants who had recovered their memories spontaneously showed exaggerated forgetting of prior remembering; patients who recovered their memories in suggestive therapy or people with continuous memories showed no such pattern. When tested on a simple laboratory task designed to estimate susceptibility to the formation of false memories, however, only people who recovered their memories in suggestive therapy showed exaggerated false-memory formation; neither the spontaneously recovered memory group nor people with continuous access to their memories showed such a pattern. These findings lend force to the idea that memories recovered in suggestive therapy and recovered spontaneously have fundamentally different origins.

The discussion thus far does not explain why some people might show greater susceptibility to forgetting prior to remembering. One possibility is that people with authentic abuse experiences might engage some of the motivated-forgetting processes discussed earlier to limit intrusive remindings of the unwanted experience. So, for example, they might learn to engage inhibitory control to suppress intrusive thoughts. If so, perhaps the reason why these people cannot remember their prior incidences of remembering is that these memories have been disrupted by the same processes at work in retrieval-induced forgetting or the think/no-think procedure discussed earlier. This hypothesis has received some support (Geraerts et al., 2007). People with spontaneously recovered memories are better at suppressing thoughts of unpleasant experiences than are people with memories recovered through suggestive therapy, or people with continuously accessible memories. Thus, people might learn to habitually suppress remindings of those events, causing them to forget their prior thoughts.

If the thought-suppression hypothesis is correct, does this present an alternative to the idea that memories can be repressed, and later recovered? It depends. On the one hand, if a memory must be consistently inaccessible over many years for it to count as repression, this research suggests a different mechanism. On the other hand, Freud emphasized the *return of the repressed* and the idea that repression needed to be actively maintained. If repression requires continual reinstatement, then suppressing intrusive remindings over the span of many years simply reflects reinstatement. Further work is required to establish the mental and biological mechanisms that account for these, and other cases of motivated forgetting. It is clear, however, that what we remember is not random, and aligns with our motivations and goals of emotional regulation.

SUMMARY

When we try to understand why we remember what we do, we cannot disregard our motivations. We often have compelling reasons for limiting retrieval of certain experiences. Sometimes, those reasons relate to functional goals, like concentration or ensuring that we access only current knowledge; at other times, they concern the regulation of emotions. People don't like to feel sad, anxious, afraid, ashamed, or embarrassed. Yet we sometimes confront reminders to memories that make us feel these feelings. When the world calls to mind such memories, people regulate their feelings by intentionally controlling memory. If such experiences are forgotten, it aids our long-term objective of maintaining a positive emotional state. The results of these ongoing efforts can be seen in people's remarkable capacity for selective remembering.

Experimental psychology has revealed a number of factors related to motivated forgetting. Surprisingly, simply telling someone to forget something often works. In some cases, this reflects a motivated failure to deeply encode a stimulus; in other cases, forgetting instructions disrupt retrieval access. Such processes might result either from the engagement of inhibitory control to suppress the preceding events, shifts in mental context, or both. People can also achieve motivated forgetting by intentionally shifting or modifying their physical context, depriving themselves of reminders. When reminders cannot be avoided, people engage inhibitory control to suppress retrieval itself, an action that impairs memory for the suppressed event. Retrieval suppression is supported by the lateral prefrontal cortex, and works in part by reducing activation in the hippocampus. Unwanted memory retrievals can also be stopped by generating diversionary thoughts, which can add interference that blocks later spontaneous retrievals of the unwanted memory, engage retrieval induced forgetting, or both. Most of these processes have been demonstrated with complex emotional materials, suggesting that they might be sufficient to account for how people regulate memory of naturally occurring events.

Sometimes, people might want to remember memories they previously wished to forget. Several factors predict when and how recovery is possible. The mere passage of time, even in the absence of efforts to retrieve, can increase the accessibility of a memory. Spontaneous recovery often occurs when memory has initially been actively dampened by inhibitory control, such as with extinction and retroactive interference. Memories can also be recovered through repeated efforts to recall. Strikingly, even when people try and fail to recall a memory repeatedly, and they are sure that they cannot recall it, later attempts might succeed. Hypermnesia and reminiscence can, at times, yield dramatic reversals of the Ebbinghaus forgetting curve. Memories can be reinstated given the availability of suitable cues. Even when memories seem impossible to recall, reinstatement of physical or mental context, or presentation of particular reminders, can, in some cases, restore a memory with little loss in information. Most of these recovery processes have been demonstrated with complex and emotional events.

Many of the motivated forgetting and motivated recovery processes discussed here could have a hand in producing recovered memory experiences. A recovered memory experience occurs when a person recollects an especially unpleasant event that is believed to have been inaccessible over many years. Such experiences have been reported for all manner of emotional events, including memory for wartime experiences, physical violence, and childhood sexual abuse. The debate about recovered memories of childhood sexual abuse has received attention, in part, because of concern over the possibility that some recovered memory experiences may be false. False recovered memories might arise, for example, when people participate in prolonged periods of recollecting an abuse event, guided by highly suggestive memory recovery techniques. False memories of abuse have indeed been induced by such procedures, underlining the role of suggestion and source memory failures in shaping what people believe has happened to them. On the other hand, many recovered memories of sexual abuse have proven to be real events that can be corroborated by physical evidence and even a confession of the perpetrator. This raises the issue of when and how often recovered memories may be real, and how such experiences come about.

Memories of childhood abuse recovered in suggestive therapy are not as easy to corroborate as memories recovered spontaneously, outside of therapy. Although lack of corroboration does not indicate that a recovered memory is false, some evidence suggests that people recovering memories under such circumstances are more suggestible. This raises the possibility that some of these recovery events might not reflect real abuse, but rather the unwitting result of suggestive therapeutic techniques. Memories recovered spontaneously, however, appear to be corroborated to the same degree as continuously accessible memories, suggesting that many of these experiences reflect real abuse. People recovering memories under these circumstances exhibit a pronounced tendency to forget their prior experiences of remembering, and also show special skill at suppressing thoughts about anxious memories. These findings suggest that some recovered memory experiences arise because people forget prior reminders of the event, perhaps through some of the motivated-forgetting processes discussed above, especially inhibition.

Research on motivated forgetting and its biological underpinnings is receiving increased attention in psychology and neuroscience due, in part, to the obvious practical problem of understanding how people control unwanted memories of past traumatic experiences. Research in this area will help to clarify how people's motivations and emotions, and our efforts to deliberately control how we feel, influence what elements we retain of our past.

FURTHER READING

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